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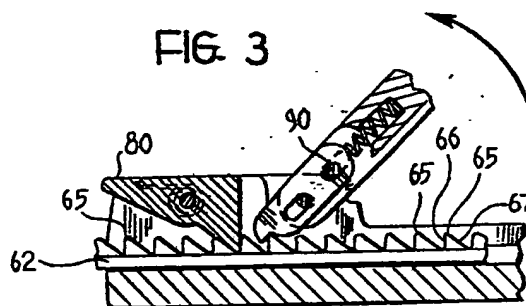
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(54) **An adjustable fastening device for sport shoes, and sport shoe incorporating said device.**

(57) A fastening device comprises a rack mechanism including a holder (75), a toothed element (62) guided slidably in the holder (75), a one-way retainer means (80) for making the toothed element (62) fast with the holder (75) in one of the two sliding directions, and a lever (82) having an operating portion (83) pivoted on the holder; the lever is adapted to engage with the toothed element (62) and drive it in the other of the sliding directions; it further comprises a working portion (84) carried slidably on the operating portion (83) and being elastically biased, in use, to engage with the toothed element (62).



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An adjustable fastening device for sport shoes, and sport shoe incorporating said device

This invention relates to an adjustable fastening device for sport shoes, which comprises a rack mechanism for pulling two shoe upper portions one over the other and including a holder, a toothed element guided in said holder for sliding movement, one-way retainer means for making said toothed element fast with the holder in one of two sliding directions, and a lever having an operating portion pivoted on the holder, said lever being adapted to engage with said toothed element and drive it in the other sliding direction.

The fastening device of this invention is particularly, but not exclusively, suited for application to cyclist shoes to pull an instep portion of the shoe, also referred to as the strap, over the upper to thereby secure the cyclist's foot firmly within the shoe.

With such shoes, the strength of the fastening device when subjected to a pull force (such as when a cyclist also pulls on the pedals during the upward stroke of the latter) and the ability to easily adjust the fastening tension with one hand are major factors.

A device of the above-mentioned kind, having a rack-and-pinion mechanism, is described in US Patent No. 3,662,435 granted to Ivor G. Allsop on May 16, 1972. That fastening device is designed primarily for ski boot use.

This prior fastening device has a fairly complicated construction which is liable to become jammed especially where the rack-and-pinion mechanism is fouled with mud or dirt.

Another fastening device is disclosed in Italian Patent Application No. 41553-A/89, filed by this same Applicant on March 17, 1989.

The last-mentioned fastening device is particularly intended for motorcyclist boot applications, wherein the mass of the fastening device constitutes no problem. With that fastening device, in fact, the toothed element of the rack mechanism must have significant strength and hardness properties because, due to the path of movement of the lever in that mechanism, the working surface presented by the teeth to the lever tends to be small. It is for this reason that the toothed element is preferably made of a metal material.

The problem underlying this invention is to provide a fastening device which has such construction and performance characteristics as to overcome all of the drawbacks with which the cited prior art is beset.

This problem is solved according to the invention by a device as indicated being characterized in that said lever has a working portion which fits slidably on said operating portion and is urged

elastically away therefrom.

The features and advantages of the invention will become apparent from the following detailed description of a preferred embodiment thereof, given by way of illustration and not of limitation with reference to the accompanying drawings, where:

Figure 1 is a side elevation view of a cyclist shoe embodying this invention;

Figure 2 is an exploded perspective view of a fastening device as mounted to the shoe of Figure 1; and

Figures 3 to 5 are fragmentary views in longitudinal section of the fastening device of Figure 2, shown at different stages of its operation.

Generally indicated at 50 in the drawings is a cyclist shoe comprising an upper 51 which includes an instep portion or strap 52 and a sole 53.

First and second fastening devices, respectively indicated at 54 and 55, are provided between the instep portion 52 and the upper 51 for tightening the shoe 50 on the user's foot.

The second fastening device 55 consists of a pull fastener, known per se, which includes a strip 56a of a material known by its registered trade name of VELCRO(TM) is passed through a slot 56b, fixedly provided on the strap 52 and then bent over on itself.

The first fastening device comprises a rack mechanism having first and second fastening elements, respectively denoted by the reference numerals 60, 61, with the first mounted to the instep portion or strap 52 and the second to a corresponding side of the shoe upper.

The first fastening element has a small strap 62 formed with a serrated surface 63 over a major section and an opposed surface which is substantially flat.

On one longitudinal end of the strap 62 opposite from the serrated section, there is formed an enlarged head 64 which projects upwardly from the plane of the surface 63.

The serrated section of said surface 63 is formed with a plurality of teeth 65 cut to a so-called sawtooth profile shape, i.e. having a face 66 substantially at right angles to the plane containing the surface 63 and a ramp-like sloping flank 67.

Formed on either sides of the set of teeth 65 is a respective straight track 68 which is substantially flat.

The first fastening device 60 further comprises an anchor element 70 for the strap 62, at an adjustable location along the strap 52.

The anchor element 70 consists of a strip 71 which is made fast with the strap 52 as by gluing and/or sewing, and which is designed to distribute

the fastening tension over a broad strap area and to distribute the pressure applied by the strap 62 when pulled tight over the tongue strap and the upper.

In the middle portion of the strip 71 there is provided a bridging formation 72 having one or more openings 73 through which the strap 62 (which comes out of the bridge formation through a port 74) can be passed.

By a change of the opening 73 through which the strap 62 is passed, the working length of the latter can be varied which extends from the bridge formation 72. With the strap engaged in the anchor element 70, the head 64 will be received in the corresponding opening 73 substantially flush with the outer surface of the bridge formation 72.

The second fastening element comprises a holder 75 through which a single slotted hole 76 is formed, for attachment to the upper 51 (either by means of a screw or rivet, not shown), such that the holder can be set in position on the upper and easily removed for replacement.

Formed on the holder 75 are two opposed shoulders 76a,b facing each other, and two guide grooves 77 adapted to accommodate the corresponding track portions 68 of the strap 62.

A one-way retainer means, consisting of a pawl 80 pivoted on a pivot pin 81 between the shoulders 76a,b is provided to enable the strap 62 to slide through the second fastening element in the direction of the arrow F in Figure 2 and to prevent it from sliding in the opposite direction.

The pawl 80 is biased by a spring 81 to mesh with the teeth 65 on the strap 62.

A lever 82, having an operating portion 83 and a working portion 84, is pivoted between the shoulders 76a,b about a pin 85, thus completing the rack mechanism of this fastening device.

The operating portion 83 comprises a flattened and enlarged portion, for convenient grasping by the cyclist, from where two parallel prongs 83a,b extend. In the above-noted portion, between the prongs 83a,b, there is formed a blind hole 86 providing a socket for a coil spring 87.

Each prong is formed with a first hole 88, for passing the pin 85 therethrough, and a second, slotted hole 89 for loosely passing a second pin 90 therethrough which is driven into a corresponding hole 91 in the working portion 84. Said working portion 84 is received and guided slidably between the prongs 83a,b and has a tooth formation 92, opposite from the hole 91, and a slotted hole 94 in which the pin 85 is received loosely.

It should be noted that the working portion 84 is urged by the coil spring 86 away from the operating portion 83.

Formed in each shoulder 76a,b, on one side relatively to the two prongs 83a,b, is a socket 95

overlaid by a camming portion 96. Snap fitted into the sockets 95 are the corresponding ends of the pin 90 projecting from the prongs 83a,b, with the lever in the non-working position shown in Figure 5.

The portions 96 act on such ends of the pin 90 to urge the working portion 84 toward the operating portion 83 of the lever 82 during the transition from the position of Figure 4 to the position of Figure 5.

This is effective to normally hold the lever 82 in the non-working position.

Attached to the shoe 1, on one side of the second fastening element, is preferably fixed a tapering shape fairing 97 effective to streamline the shoe and protect the second fastening element against incidental impact.

To fasten the shoe 1 on, the second fastening device 55 is first tensioned manually, and the first device 54 is then set for fastening by passing the strap 62 through one of the openings 73 such that its serrated section 63 comes out through the port 74.

Thereafter, the end of the strap 62 which projects from the anchor element 70 is passed through the gap between the holder 75 and the pawl 80 of the first fastening element 71 in the direction of the arrow F of Figure 2.

The running movement of the strap 62 is guided by the grooves 77. The flank 67 of the teeth 65 will urge the pawl 80 to swing against the spring 81, thereby the strap 62 is allowed to run through the second fastening element 61.

At this stage, the lever 82 is held in the non-working position shown in Figure 5.

Next, the lever 82 is grasped via its operating portion 83 and raised in the direction of the arrow in Figure 3. The ends of the pin 90, on leaving their respective sockets 95 and engaging with the profile of the portions 96, will urge the working portion 84 of the lever rearwards into the gap between the prongs 83a,b, against the bias force of the spring 87. This provides, additionally to the above-noted function of retention of the lever 82 in the non-working position thereof, for the lever to be held close against the pawl 80, because the working portion 84 would be pulled toward the operating portion during the initial phase of the lever operation, when there may be interference with said pawl, thereby the second fastening element 61 can be made significantly compact.

On the lever 82 reaching the position shown in Figure 3, it will engage with the teeth 65 on the strap 62.

Since the working portion 84 of the lever 82 is telescoping on the operating portion 83 and urged elastically toward the teeth 65, said working portion 84 will be retracted partway between the prongs 83a,b as the lever is pivoted from the position shown in Figure 3 to the position shown in Figure

4, in accordance with the decreased distance of the tooth 65, being engaged by the tooth formation 92, from the pivot axis of the lever (pin 85).

This avoids, in the first place, damaging the strap 62, and secondly, causes the pressure applied by the tooth formation 92 to be distributed all across the face 66 of the engaged tooth 65.

In pivoting the lever in the direction of the arrow shown in Figure 4, the tooth formation 92 will be caused to slide on the back 67 of the teeth 65 and retract between the prongs 83a,b in a sprung fashion.

The operation is repeated until the required fastening tension has been achieved.

On the other hand, when the shoe fastening tension is to be released, a slight pressure will suffice on a knurled portion of the pawl 80 to cause it to swing about its axis against the spring 81 and release the strap 62 in order for the latter to be run in the opposite direction to the arrow F shown in Figure 2.

On account of the strap 62 being constrained laterally by the grooves 77 which guide it on the holder 75 and are extended downstream from the pawl 80 as well, relatively to the direction of introduction of the strap through the holder, the serrated section of the strap 62 can be prevented from being lifted within the holder 75 and causing seizure of the teeth 65 on the working end of the pawl 80 liable to interfere with the fastening device releasing.

The fastening device of this invention has proved its practical value in adjusting the fastening tension of cyclist shoes with one hand and without raising the feet off the pedals.

However, it is envisaged that this same fastening device may also be applied, without any substantial alteration, to sport shoes of another kind.

Among the several advantages afforded by this invention is that its structure is simple and reliable, easy to operate even by inexperienced persons. Further, the particular structure of the lever 82 prevents any damaging or wearing of the serrated section of the strap 62. For this reason, the strap may be formed from relatively soft materials, such as conventional plastics, which have significant flexibility.

In addition, the device can be readily replaced if damaged, and tends to self-align along the direction of the pull exerted on the strap.

Claims

1. An adjustable fastening device for sport shoes, comprising a rack mechanism for pulling two shoe upper portions one over the other and including a holder (75), a toothed element (62)

guided in said holder (75) for sliding movement, one-way retainer means (80) for making said toothed element (62) fast with the holder (75) in one of the two sliding directions, and a lever (82) having an operating portion (83) pivoted on the holder (75), said lever (82) being adapted to engage with said toothed element (62) and drive it in the other sliding direction, characterized in that said lever (82) has a working portion (84) which fits slidably on said operating portion (83) and is urged elastically away therefrom.

2. A device according to Claim 1, characterized in that said one-way retainer means comprises a pawl (80) mounted to the holder (75) and being biased elastically into engagement with said toothed element (62).

3. A device according to either Claim 1 or 2, characterized in that said toothed element (62) comprises a sawtooth serration (63).

4. A device according to one or more of the preceding claims, characterized in that said toothed element (62) is resilient.

5. A device according to one or more of the preceding claims, characterized in that said toothed element (62) is in the form of a strap and removably attached to one of said upper portions, with said holder (75) mounted on the other of the upper portions.

6. A device according to Claim 5, characterized in that it comprises an anchor element (70) for said toothed element (62) including a bridge formation (72) which has at least one opening (73) where through said strap (62) can be fitted releasably for anchoring on the shoe upper.

7. A device according to Claim 6, characterized in that said toothed element (62) has an enlarged head (64) at one end adapted to be substantially tucked away in said at least one opening (73).

8. A device according to either Claim 6 or 7, characterized in that said anchor element (70) comprises a strip (71) effective to distribute the fastening tension over said shoe upper.

9. A device according to one or more of the preceding claims, characterized in that said operating portion (83) has two prongs (83a,b) through which said lever (82) is pivoted on said holder (75), said operating portion (84) being guided slidably between said prongs.

10. A device according to one or more of the preceding claims, characterized in that said lever (82) is adapted to be releasably locked by snap action in a non-working position on said holder (75).

11. A device according to Claim 10, characterized in that to releasably lock said lever (82) in the non-working position thereof, at least one lug is arranged to extend from said lever (82) and to snap fit into a corresponding socket (95) in said holder

(75), a camming means (96) being provided on said holder to drive said lug into and out of said socket (95).

12. A device according to Claim 11, characterized in that said lug (90) is fast with said working portion (84) of the lever.

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13. A device according to Claim 12, characterized in that it comprises a pivot pin (90) fitted through said working portion (84) of the lever (82) and having free ends passed through slotted holes (89) in said operating portions (83) to slidably support said working portion (84) on said operating portion, the free ends of said pin (90) forming said lugs.

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14. A device according to Claim 2, characterized in that said toothed element (62) is held guided on said holder at least at said pawl (80) location.

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15. A sport shoe incorporating at least one fastening device as claimed in one or more of the preceding claims.

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16. A sport shoe according to Claim 15, characterized in that it comprises a fairing (97) attached to said shoe upper at at least one of said fastening devices.

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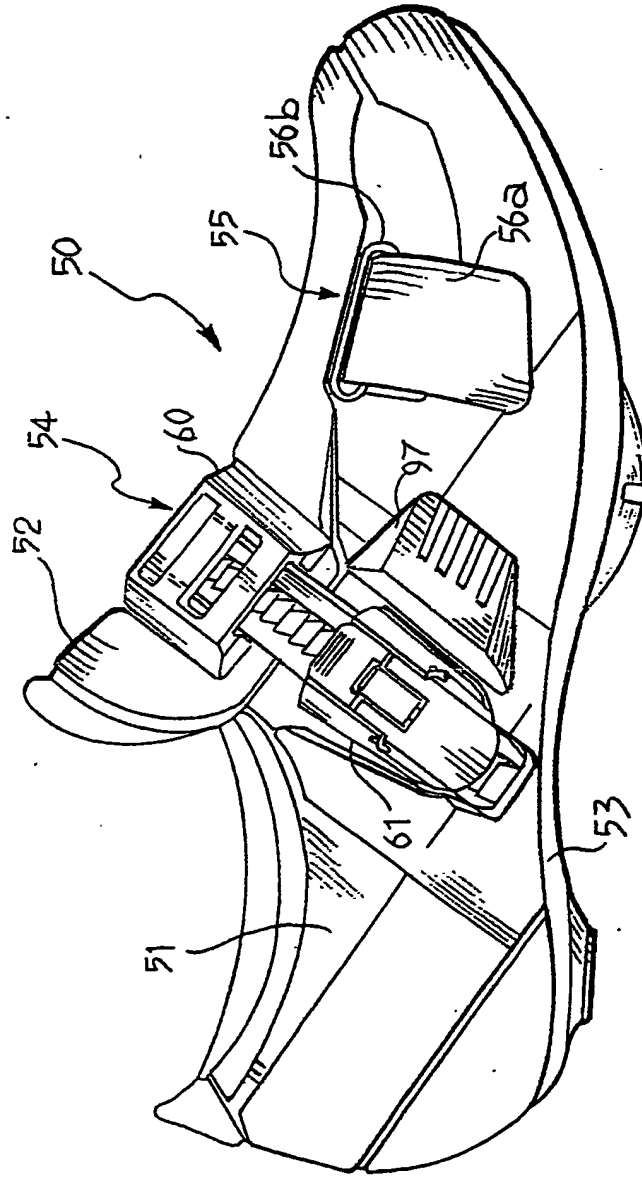
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FIG. 1



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F/G

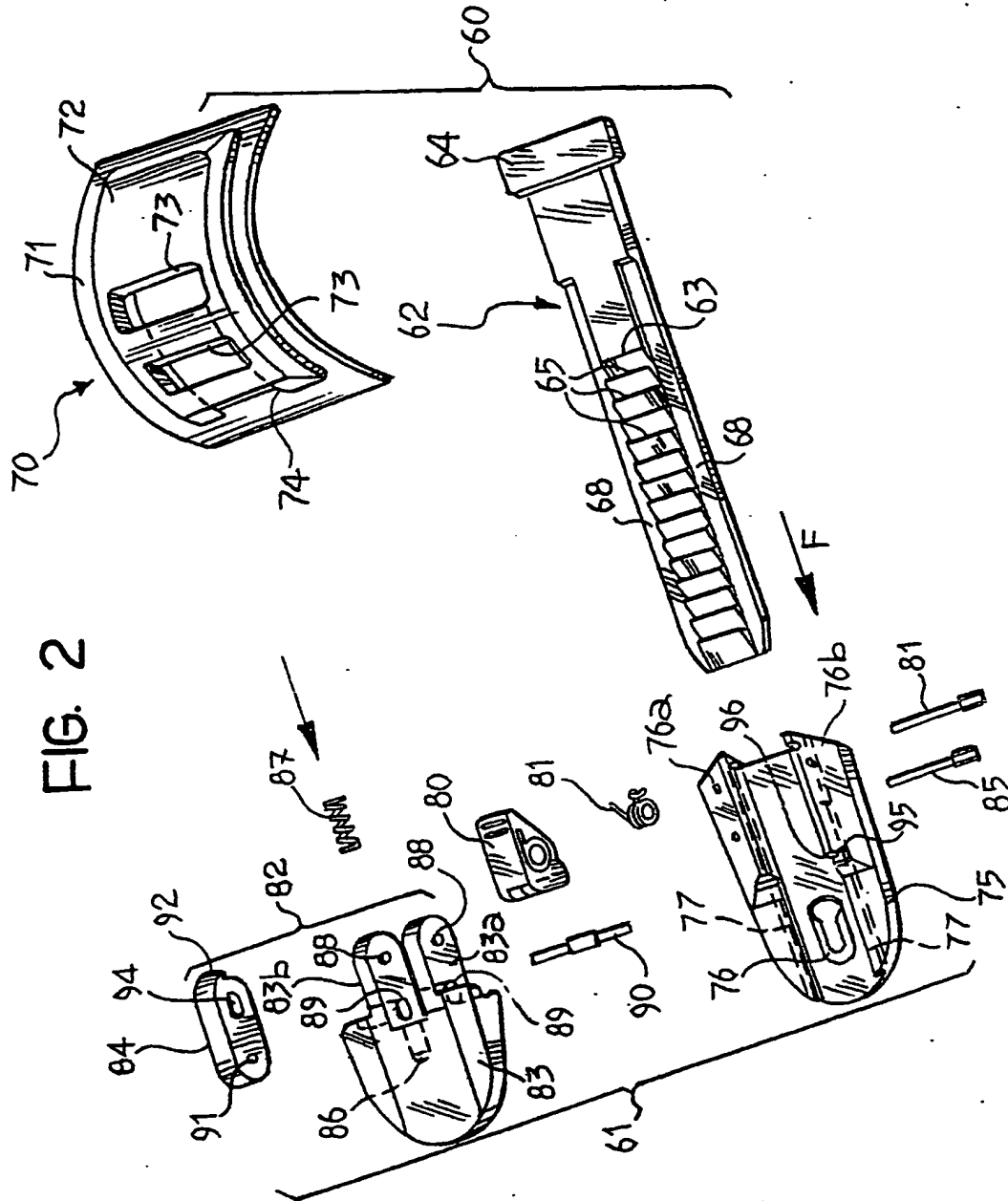


FIG. 3

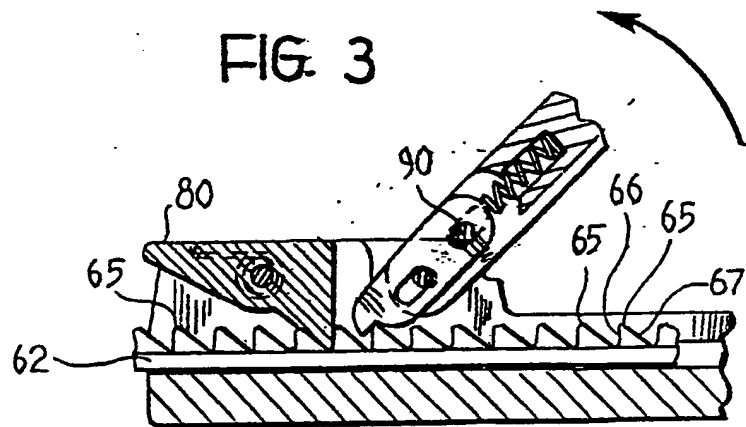


FIG. 4

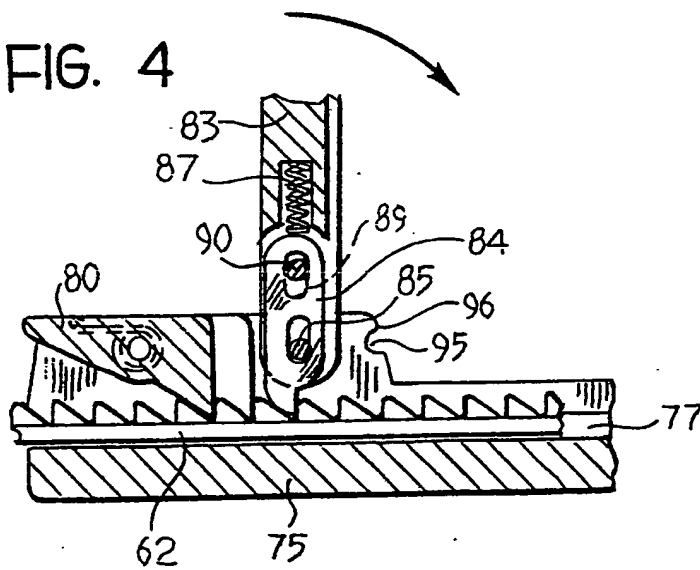
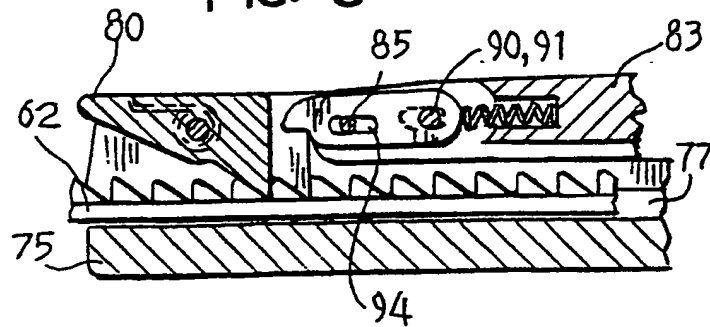


FIG. 5





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EUROPEAN SEARCH REPORT

Application Number

EP 89 11 9152

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	US-A-3 662 435 (ALLSOP) ---	1-5, 9, 10	A 43 C 11/14 A 43 B 5/00
Y	EP-A-0 259 896 (RAICHLE) * Column 4, lines 1-35; claims 1,4; figures 3-5 *	1-5, 9, 10	
A	---	11,12	
A	US-A-4 453 290 (RIEDEL) -----	1-5	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A 43 C A 43 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 07-09-1990	Examiner KUHN E.F.E.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			